THE NEW ARMENIAN MEDICAL JOURNAL
Volume19 (2025), Issue 3, p.75-81

DOI: https://doi.org/10.56936/18290825-3.19v.2025-75

PERIOPERATIVE MANAGEMENT OF CESAREAN SECTION IN A PATIENT WITH SEVERE SCOLIOSIS: A CASE REPORT

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Received 11.07.2024; Accepted for printing 15.05.2025

Abstract

Background: Scoliosis presents distinctive concerns during pregnancy because it might affect maternal respiratory function and obstetric outcomes. We report a case of a pregnant patient with severe scoliosis receiving anaesthesia for a caesarean section.

Case: A 30-year-old woman pregnant at 34/35 weeks with severe dextroscoliosis thoracalis. The preoperative examination showed a Cobb angle of 70 degrees. The patient has signs of threat of respiratory failure. During the recovery period the patient was difficult to wean from the ventilator

Discussion: Before surgery, arterial blood gas analysis, and echocardiography were conducted to evaluate lung and cardiac function. Anaesthesia was administered by general anesthesia method. During the surgery, continuous pulse oximetry, capnography, and invasive arterial pressure monitoring were used to guarantee the safety of both the mother and the foetus. The patient had a successful response to the anaesthetic, maintaining stable hemodynamic during surgery and achieving effective pain management. The baby in good health was born through a caesarean section without any issues.

Conclusion: Thorough preoperative evaluation, precise intraoperative supervision, and a customised anaesthetic strategy to guarantee safe and efficient treatment for pregnant patients with scoliosis having a caesarean section.

Keywords: *scoliosis; anaesthesia; management; perioperative; maternal health*

Context

Spine abnormality in pregnant women occur rarely, with only a small percentage of cases documented in the literature [*Shakil, Iqbal and Al-Ghadir, 2014*]. The National Scoliosis Foundation reports that around 4-5% of the global female population has scoliosis, with a ratio of 1:9 compared to men [*Aebi, 2005*]. Women have a more flexible spine, whereas men have a denser spinal structure [*Shakil, Iqbal and Al-Ghadir, 2014; Smit, 2020*]. Scoliosis progresses more rapidly in women than in males and is of unclear cause, described as idiopathic [*Smit, 2020*]. Additionally, one side of the back may appear taller than the other, especially noticeable when bending or kneeling. Spinal abnormalities can worsen the condition of pregnant mothers [*Dewan et al., 2018; Walsh et al., 2021*]. Further assessment is required to determine the appropriate delivery strategy based on the degree of tilt and type of scoliosis present in the patient. Women with scoliosis may encounter difficulties during labour such as prolonged or stalled active labour due to malposition or abnormalities in the

Cite This Article as:

Zharfan A.S., Airlangga P.S., Santoso K.H., Fitriati M. (2025). Perioperative management of cesarean section in a patient with severe scoliosis: a case report; The New Armenian Medical Journal, vol.19 (3), 75-81; https://doi.org/10.56936/18290825-3.19v.2025-75

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baby's position [*Theroux et al., 2023*]. If the slope is steep, a caesarean section may be considered as a possibility. Effective management is essential to get optimal therapy results in this scenario [*Matthews et al., 2015; Grabala et al., 2019*]. The aim of this case report study is to describe the perioperative management of a pregnant patient with severe scoliosis.

THE PATIENT'S CONDITION: The case involved 30-year-old pregnant women with with a body weight of 50 *kg*, height 147 *cm* BMI 23.1. Patient diagnosed with second pregnancy with gestational age 34/35 weeks, observation of dyspnea et causa pleural effusion dextra, tricuspid regurgitation moderate, premature rupture of membranes <24 hours, intermediate probability pulmonary hypertension, bronchial asthma pro evaluation, severe dextroscoliosis thoracalis, anaemia (Hb 7.3) on correction, hypoalbuminemia (Alb 2.62), estimated foetal weight 2100 *g*, who presented to tertiary hospital. The patient was planned for caesarean section. A thorough medical history was obtained, and a detailed physical examination was conducted. Relevant diagnostic tests, including laboratory investigations, imaging studies, and other ancillary tests, were performed to aid in the diagnosis and management of the patient.

The patient knew that she had been suffering from scoliosis since in 4th grade, but the patient had never sought treatment anywhere. Because the patient felt short of breath when walking and seemed to be panting, the patient was referred from the hospital for control to a heart specialist. The patient came to the emergency room of a tertiary hospital, the patient felt short of breath, especially when doing activities. The patient underwent echocardiography and laboratory examination. Because the patient's condition did not improve, the patient be referred to tertiary hospital. Patient planned for caesarean section due to abnormal nonstress test Category II recurred.

The patient's condition immediately before surgery was airway clear spontaneous breathing, respiratory rate 24*x/minute*, SpO_2 98% with simple mask 6 l*pm* although signs of distress were still visible. Auscultation of the right lung was normal, but left lung breath sounds were limited to the apex, crackles at the base of the right lung, no wheezing, warm perfusion. Blood pressure 126/85, heart rate 96*x/minute*, Glasgow Coma Scale 456, NRS 2-3. The patient had a urinary catheter installed; urine production was 200 *ml* in 4 hours, temperature 36.7^{o}C.

Anesthetic airway assessment showed a mallampatti score of two, with intact teeth, adequate mouth opening, and complete neck movement. Spinal examination revealed a lateral curvature of VTh3 - VL2. The lower lumbar vertebrae are not clearly visible and the intervertebral spaces are difficult to identify. The patient has a history of recurrent respiratory tract infections. The patient has a history of chest x-ray examination (Fig.1). However, the patient did not have a pulmonary function test. Chest X-Ray shows lateral curvature of the dorsal spine with rotation of the heart, and a Cobb angle of curvature of 70°C.

Electrocardiogram examination pre operation show sinus rhythm 93x/minute; frontal and horizontal axes within normal limits. On preoperative laboratory examination, anaemia was found (Hb 7.3). thrombocytopenia (Plt 132,000) Hyponatremia (Na 132), Hypoalbumin (Alb 2.62). Blood Gas Analysis with standardized methodology 6 liters

FIGURE 1. *Chest X-ray examination pre operation*

per minute (6 LPM) of supplemental oxygen, pH 7.29, partial pressure of carbon dioxide (PCO_2) 69, PO_2 156, HCO_3 33.2, BE 6.6, SaO_2 99, Fraction of inspired oxygen (FiO_2) 50%. PaO_2/FiO_2 ratio (P/F ratio) 312. Interpretation of Arterial Blood Gas Analysis was consistent with expected HCO3 = 33.6, which show chronic respiratory acidosis.

Preoperative Transthoracic Echocardiography results was Left ventricular concentric remodelling, ejection fraction by TEICH method 78%, normokinetic left ventricular segmental analysis. Left ventricular diastolic function was normal. Right ventricular dimensions and systolic function were normal (tricuspid annular plane systolic excursion 1.9 *cm*). Left and right atrial dimensions were normal. No thrombus or intracardiac vegetation was found. Normal mitral heart valves, normal aorta, normal pulmonary, Tricuspid: moderate tricuspid regurgitation (tricuspid regurgitation maxPG 39.45 *mmHg*). There was no pericardial effusion or pleural effusion. Thorax X-ray cesults: lung inflammation, right pleural effusion, and thoracic dextroscoliosis. Ultrasound Results: estimated fetal weight 2172 *g*, Placenta is in the fundus/gr. II. amniotic fluid index 3.01*cm*.

Based on the patient's physical condition, the patient is included in American Society of Anesthesiologists grade III, with moderate tricuspid regurgitation comorbidities, moderate probability of pulmonary hypertension, anemia (7.3) post Transfusion 1 Packed Red Cells, hypoalbuminemia (2.62) Thrombocytopenia (132,000), suspected Dextral Pleural Effusion, history of bronchial asthma, severe dextroscoliosis thoracic. Before surgery, 1 unit of whole blood was ordered.

The patient was transferred to the operating room where peripheral venous access was secured with an 18*G* cannula. The patient was given Ringer's lactate 10 *ml/kg.* Continuous electrocardiogram, Non-invasive blood pressure, and pulse oximetry monitoring was performed. Various anesthetic options were discussed. The patient is planned to undergo anesthesia with General Anesthesia, with Intubation airway Management. Patients are induced with ketamine 80 *mg*, rocuronium 50 *mg*. Intubation was carried out with an endotracheal tube of 7.0 *mm* with a right lip border cuff of 18 *cm*, vesicular breath sounds, symmetry in both lung fields, etCO2 (+) read, fixation. Maintenance of anesthesia use isoflurane gas after the baby is born. During surgery, etCO2 is maintained between 55-60 (according to the baseline). No desaturation was noted during the intubation procedure and the patient was breathing spontaneously. The ventilator was set to a tidal volume of 280 *cc*, post expiratory end pressure 6 *cm* H_2O with a frequency of 20 times per minute and saturation and end tidal CO_2 were maintained.

The patient then underwent caesarean section. Born baby boy/ 2000*g*/ 44_{cm}/ AS 8-9/ clear amniotic fluid. There was no hypotension in the perioperative period. Hemodynamic during surgery showed blood pressure ranging from 135-170/85-100 *mmHg* (a mean arterial pressure 101-123*mmHg*), heart rate 78-108 *x/minute*. During operation Fluid Balance, given RL crystalloid input 250 *ml*, blood product Packed Red Cells (B+) 212 *ml*. The output was obtained with bleeding of 200 *ml*, and urine production of 150 *ml*.

After surgery, patient was closely monitored in intensive care. The patient was taken to the ICU in an intubated condition. In ICU, the patient's clinical condition was the clear airway, intubated, support ventilator Pressure-synchronized intermittent mandatory ventilation mode, Pinsp 15, post expiratory end pressure 5, respiratory rate 20*x/minute*, Fraction of inspired oxygen (FiO_2) 40%, achieved Ppeak 19, minute ventilation 4.3 tidal volume 222, Ftot 20*x /minute*, SpO_2 99%, no crackles, no wheezing. Blood pressure 146/88 (107), heart rate 89 *bpm* regular rhythm. Glasgow Coma Scale 4x6. The patient still has a catheter installed; urine production is 100 *ml/last 2 hours*. Abdomen with post-operative dressing, good uterine contractions, minimal fluxus, temp 36.8. Post-operative laboratory investigations showed Hb 10.8 white blood cell (WBC) 15,840 Alb 2.49. Postoperative Blood Gas Analysis (minute ventilation 3.3, tidal volume 240, Fraction of inspired oxygen (FiO_2) 40%), pH 7.243, partial pressure of carbon dioxide (PCO_2) 74, PO_2 128 HCO_3 31.9 BE 5, SaO_2 98, Fraction of inspired oxygen (FiO_2) 40%, P/F ratio 320. Patients are closely monitored in the intensive care unit, by maintaining clear airway and SpO_2 >95%, evaluating vital signs (blood pressure, pulse, respiratory rate, Tax, SpO_2) every 15 minutes. Evaluation of urine production is carried out every 1 hour. Evaluation of post operative wound, uterine con-

FIGURE 2 *Chest X-ray examination after operation. Impression: Post-operative chest X-ray evaluation revealed lung inflammation, cardiac showed no abnormalities, severe dextroscoliosis thoracalis.*

tractions and fluxus. Evaluation of pain scale. The patient is warmed with a blanket.

The patient received RL 500 ml infusion therapy + oxytocin 20 IU in 24 hours, IV Paracetamol 1 *g* every 8 hours for 2 days, IV Metamizole 1 *g* every 8 hours for 2 days, IV Metoclopramide 10 *mg* every 8 hours for 2 days, pump Dexmedetomidine 0.3 *mcg/kg/hour*. The patient's condition after surgery on the second day, free airway, tube in, ventilator support *SPONT* mode, Psupp 5, post expiratory end pressure 5, Fraction of inspired oxygen (FiO_2) 28%, achieved Ppeak 9.1, minute ventilation 3.9 tidal volume 271, Ftot 15x/minute, SpO_2 99%, there are no crackles and no wheezing. Blood pressure 134/89, heart rate 99 bpm regular rhythm. Glasgow Coma Scale 4X6. Urinary via catheter, urine production 50*ml/last 2 hours*. Abdomen, uterine contractions are good, minimal flux. temp 36.6. The previous therapy was continued, but fluid intake was adjusted with RD5 500*ml/24 hours*, and 6 x 100 *ml* milk via nasogastric tube were started. Sedation with dexmedetomidine was discontinued (Fig. 2).

The patient underwent a follow-up examination with an ultrasound thoracic marker, it was found that there was no visible pleural effusion in the right and left hemithorax, and no skin marking was performed on the right and left hemithorax (Fig.3).

A repeat albumin evaluation examination showed hypoalbumin 2.54. Blood Gas Analysis evaluation (minute ventilation 3.3, tidal volume 240, Fraction of inspired oxygen (FiO_2) 30%), pH 7.27, partial pressure of carbon dioxide (PCO_2) 62, PO_2 94, HCO_3 28.5, BE 1.6, SaO_2 96, Fraction of inspired oxygen (FiO_2) 30%, P/F ratio 313.

Based on the assessment of clinical respiratory condition and with stable hemodynamic parameters, the patient was extubated on the third postoperative day and taken to the high care unit. Patient with clear airway condition, spontaneous breathing 18-20 times per minute, no wheezing or crackles. SpO_2 98% with simple mask 6 lpm. The patient's blood pressure is 124/85 *mmHg*, heart rate 81*x/minute*, acral warm, dry red. The patient is well conscious, Glasgow Coma Scale 4x6, bilateral pupil isochore. Urinary via catheter, urine production 200 *ml* in the last 3 hours, bright yellow. Uterus contraction was good. There is no active flux. No extremity edema, temperature 36.5°C. The patient has started a soft diet high in calories and high in protein. The patient was motivated to mobilize, and respiratory physiotherapy.

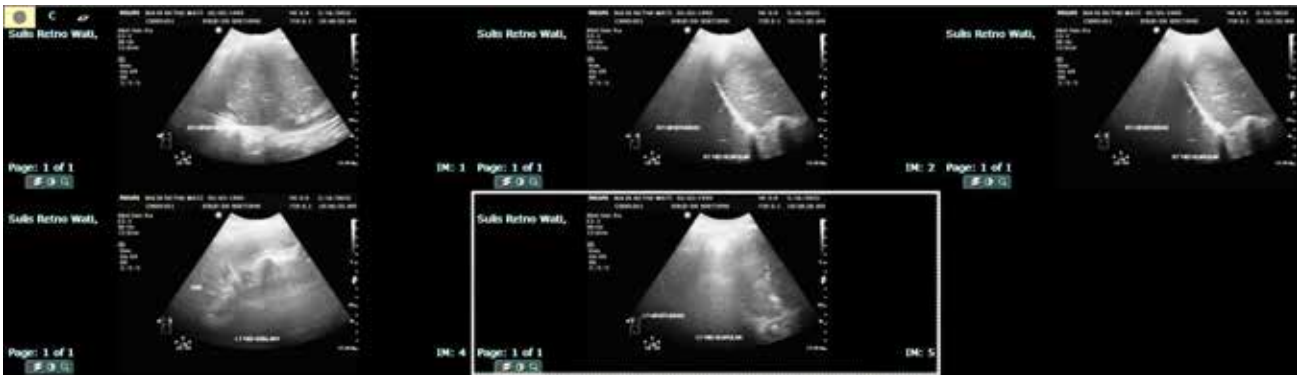

FIGURE 3. follow-up examination with an ultrasound thoracic marker.

Discussion

Scoliosis is a spinal condition marked by lateral curvature and rotation of the spine, primarily idiopathic in nature and more prevalent in women [*Runhaar, 2021*]. It can lead to restrictive lung disease and hypoxemia, potentially resulting in cardiovascular complications and even mortality if severe cases remain untreated [*Koumbourlis, 2006; Ran, Zhi-hong and Jiang-na, 2011*]. Anaesthesia procedures in individuals with scoliosis, especially women, require meticulous placement and consideration due to associated challenges in administering spinal or epidural anaesthesia, as well as potential airway complications [*Matthews et al., 2015*]. Patients with scoliosis often exhibit restrictive ventilation defects, which can be evaluated through spirometry and pulmonary function tests, reflecting reduced lung capacity, and increased respiratory rate [*Grivas, 2022*]. The severity of pulmonary obstruction correlates with the degree of spinal curvature. Furthermore, severe scoliosis may cause displacement of the trachea and bronchial tree, complicating intubation during general anaesthesia. Radiological assessment using the Cobb angle helps determine the necessity for surgical correction when exceeding certain thresholds [*Raczkowskiet al, 2010; Runhaar, 202*1].

General anaesthesia is preferred in scoliosis cases with maternal cardiopulmonary disease or difficulties in regional block implementation [*Nandoliya et al., 2023*]. However, challenges may arise during intubation due to altered airway anatomy and increased pulmonary artery pressure risks [*Chan et al., 2017; Addai, Zarkos and Bowey, 2020*]. Perioperative care must be taken to avoid exacerbating pulmonary vascular resistance. Patients with neuromuscular scoliosis may experience laryngeal and swallowing issues, increasing the risk of aspiration during and after surgery [*Matthews et al., 2015; Liu et al., 2019*]. Pregnancy-related physiological changes exacerbate respiratory function impairment in scoliosis patients, emphasizing the importance of preoperative assessment and careful intraoperative management [*Betz et al., 1987; Snetkov et al., 202*0]. Increased intra-abdominal pressure and decreased subarachnoid space in pregnancy can complicate anaesthesia administration, especially in severe scoliosis cases with decreased cerebrospinal fluid volume [*Grabala et al., 2019; Nandoliya et al., 2023*].

Patients with severe scoliosis are at higher risk of perioperative respiratory complications, necessitating strategies such as pre-oxygenation, lung protection during surgery, and vigilant postoperative monitoring [*Ran et al, 2011*]. Reduced functional residual lung capacity and altered respiratory mechanics further contribute to respiratory distress in these patients [*Theroux et al., 2023*]. The combination of severe scoliosis and pregnancy poses additional challenges for anaesthesia management, requiring thorough preoperative evaluation and specialized care to mitigate risks for both mother and foetus [*Jiong Hao Tan and Hee-Kit Wong, 2020; Grivas, 2022*]. Pelvic changes associated with scoliosis may complicate labour and delivery, potentially necessitating caesarean section in a significant proportion of cases [*Falick-Michaeli et al., 2016*].

Scoliosis presents unique challenges in anaesthesia management, particularly in women and during pregnancy [*Snetkov et al., 2020; AlNouri et al., 2022*]. Comprehensive preoperative assessment, careful intraoperative monitoring, and tailored anaesthesia strategies are essential to minimize complications and ensure optimal outcomes for both mother and child [*Aebi, 2005; Falick-Michaeli et al., 2016; Runhaar, 2021*]. The authors found increased spontaneous ventilation, and increased response to $PaCO_2$. During labor, careful monitoring of maternal vital signs and arterial blood gases will be necessary [*Hong et al., 2013; Walsh et al., 2021*].

Conclusion

In conclusion, preoperatively, severe scoliosis patients require assessment for postoperative respiratory complications. Intraoperative measures must address hemodynamic compromise and ventilation. Postoperatively, weaning from ventilation should be gradual, employing a multidisciplinary approach. Anaesthesia management during pregnancy in scoliosis patients necessitates thorough preoperative evaluation and tailored intraoperative monitoring. Safe anaesthesia for caesarean section in severe thoracic scoliosis considers both scoliosis and pregnancy-related physiological changes. Further research is warranted to refine anaesthesia protocols for pregnant women undergoing caesarean section with scoliosis.

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Acknowledgments: *We would like to express our gratitude to everyone, and every department involved in the successful management of the case. Our appreciation goes to the obstetricians and anaesthesiologists for collaborating to ensure the safety and well-being of the mother and baby. We also thank the nursing staff, operating room personnel, and other healthcare providers for their dedicated support and assistance throughout the perioperative period.*

THE NEW ARMENIAN MEDICAL JOURNAL
Volume19 (2025). Issue 3

CONTENTS

THE NEW ARMENIAN MEDICAL JOURNAL

Volume19 (2025). Issue 3

The Journal is founded by
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Our journal is registered in the databases of Scopus, EBSCO and Thomson Reuters (in the registration process)

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Copy editor: Kristina D Matevosyan

LLC Print in "Monoprint" LLC

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